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ABSTRACT

Presented is a final report designed to analyze factors successful in the implementation of innovative science programs in elementary and secondary rural schools in Missouri. Thirty elementary schools in a 25 county area were studied and data gathered via multiple choice questionnaires and personal interviews. Thirty-one secondary schools were randomly selected from those located in the 25 counties comprising the northeast corner of Missouri. A Basic Secondary Questionnaire was given to 65 secondary teachers, with 34 being randomly selected from this group to complete an in-depth teacher interview. Principals and/or superintendents of the participating secondary schools also completed a Secondary Administrative Questionnaire. Teacher and administrator factors were identified as affecting implementation of innovative programs. Data and results are presented separately for each of the two major educational levels. Copies of the questionnaires used are included in the appendix of the report. (PEB)

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Final Report

Project 2-G-023
Grant No. OEG-7-72-0011 (509)

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An Analysis of Factors Successful in the Implementation of Innovative Science Programs in the Elementary and Secondary Rural Schools.

June, 1973

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

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PREFACE

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ARSTRACT

PART I - ELEMENTARY

This study was designed to identify and quantify factors which have been successful in the implementation of innovative science programs in the science classrooms of rural public schools in northeast Missouri. In the twenty-five county area, thirty elementary schools were investigated. Multiple choice questionnaires and personal interviews were analyzed using the MULRO4 correlation procedure. Teacher factors identified as affecting implementation of innovative programs are the effect of college science academic and science methods courses, the teachers' feelings of adequacy in teaching science, and the effect of administrative encouragement and necessary financial support. Administrator factors identified are the administrators' role in initiating the programs and encouraging the teachers, the necessity of financial support, and the relationships between the administrator's science background and his knowledge of the rationale and operation of innovative curricula. Based upon factors identified, elementary teacher science courses: should contain concepts appropriate for use in elementary school teaching; should include inquiry-oriented laboratory activities; and should include a study of innovative curricula as an integral aspect of science methodology courses. If the above course objectives are attained, elementary school teachers will teach science confidently and effectively. Similarly, if administrators take key science content/methodology courses, they will understand the objectives of innovative science programs and will be of more assistance in the implementation of such curricula.

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PART I - ELEMENTARY

CHAPTER 1 - INTRODUCTION

THE PROBLEM

Because students of today live in a scientific age, they need to understand the impact of science on the environment and on daily living. Public school science programs and text books have been criticized by scientists for not teaching the conceptual bases of science and the method scientists use to discover knowledge of the universe. Because of this concern, groups of scientists working with educators have produced materials and programs of instruction for the public schools. Most of the programs had Federal support and all went through repeated cycles of writing, tryouts, and revisions before and after release.

There are many conflicting reports in literature concerning the overall impact and general effectiveness of the innovative science curricula (Cronbach, 1963; MacDonald and Raths, 1963; Hastings, 1964; Scriven, 1965; Abramson, 1966; Ausubel, 1966; Stake, 1966). That these new materials and programs are not reaching the majority of public school students for whom they were intended is of grave concern to many scientists and scholars (Hastings, 1964; Heath, 1964; MacDonald and Raths, 1963; Stake, 1966; Woodring, 1964). There is also concern on the part of some educators that the reports being submitted by evaluating teams do not reflect an accurate picture of the uses being made in public schools of these new science curricula (George, 1965; Yager, 1969; Morgan, 1969; Carter, 1970).

Evaluation of the new science programs indicates that innovative methodology increases scientific literacy more effectively than does the traditionally oriented type of courses (Moore, 1970; Phillips, 1970; Matthews, 1970). Research reveals that the innovative programs are more interesting to students and provide a firmer base for understanding future science materials (Rowe, 1966).

The authors of this paper assume that if proper techniques are utilized, an accurate picture of actual classroom practices can be obtained. From this analysis it will be possible to determine something of the nature of the factors which contribute to the implementation and full utilization of innovative practices in the science classroom.

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DEFINITION OF TERMS

INNOVATIVE refers to the recently-developed science programs which emphasize the "inquiry," or problem-solving, method of teaching rather than the traditional method of presentation of facts, laws, and theories for memorization by the student.

RURAL SCHOOLS are public schools operating in rural areas which are predominantly agricultural in nature. For the purpose of this study, they will include schools in small towns (less than 20,000) whose main economic sources are agricultural.

STATEMENT OF OBJECTIVES

It is the purpose of this study to identify and quantify factors which have been successful in the implementation of innovative science programs in the science classrooms of the public schools in rural areas of northeast Missouri.

It is assumed that there are factors which contribute to the successful implementation of innovative programs and that these may be categorized as the "teacher factors" and the "administrative factors."

Teacher Factors:

1. In what manner did the college academic science preparation of the teacher contribute to the successful implementation of innovative science in the classroom?

2. Was the teacher's college methods course(s) a factor in successful implementation of innovative science in the classroom?

3. What role did teacher participation in institutes preparing for teaching of innovative techniques play in successful classroom implementation?

4. Were workshops in innovative science a contributing factor to the implementation of innovative science in the classroom?

5. Was the teacher's feeling of adequacy and/or competency a factor in the implementation of innovative science in the classroom?

6. Did the administration encourage and support the implementation of innovative science programs?

Administrative Factors:

1. How did the administration encourage and assist the teacher in the implementation and utilization of innovative science programs?

2. Did the administration support the new programs by means of additional or special expenditures?

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3. As mediated through the administrative offices, does community involvement in science play a role in successful implementation of innovative science programs?

LIMITS OF THE STUDY

In the twenty-five counties which comprise the northeast quarter of the State of Missouri there are 185 elementary schools which are currently supervised by 153 elementary principals. These elementary schools employ 2,636 teachers and have a total enrollment of 56,055 elementary pupils.* These twenty-five counties contain ninety-five separate school districts. The number of separate legal school districts varies from nine districts in Boone County to one each in Knox, Ralls, and Schuyler Counties.

Thirty elementary schools were randomly selected from the aforementioned counties of northeast Missouri. Two hundred thirty-six elementary teachers completed the Basic Elementary Questionnaire. Thirty-nine randomly selected teachers from this group completed a second questionnaire--Elementary Teacher Interview In-Depth. Twenty-five principals of the participating elementary schools completed the Elementary Administrative Questionnaire.

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*Data compiled from Missouri School Directory 1972-1973, State Board of Education, Arthur L. Mallory, Commissioner of Education.

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PART I - ELEMENTARY

CHAPTER 2 - PROCEDURES

Using the technique of random selection, at least one elementary school was selected from each of the twenty-five counties in northeast Missouri. An additional five selections were drawn at random from the total number remaining in the pool. Each school was visited by an interviewer who distributed a Basic Elementary Teacher Questionnaire to each teacher, and an Interview In-Depth Questionnaire to a second group of teachers randomly selected from the basic group. Teachers who completed Interview In-Depth Questionnaires were individually interviewed to determine if there was information which needed to be considered which had not been included in the first two questionnaires.

The Basic Elementary Teacher Questionnaire was designed to (1) collect pertinent demographic data concerning grade level taught, age, degree(s), and number of years and type of teaching experience, (2) to determine if the teachers were using innovative programs in science and the extent to which the programs were being used, (3) the manner in which information about the new programs had been acquired, (4) the teacher's personal evaluation of the impact science academic and educational methods courses had upon her teaching, (5) the teacher's feeling of adequacy in teaching science, and (6) the relationship between the principal and the community in the establishment of new programs.

The Elementary Teacher's Interview In-Depth was designed to obtain additional information regarding (1) the method whereby science background knowledge was obtained, (2) the teacher's feeling of adequacy in teaching science, (3) the teacher's method of conducting classes, (4) the type of science library facilities, (5) the availability of audio-visual equipment for science use, (6) the time available for science teaching, and (7) the effect of curriculum at the college level as it relates to science teaching.

The elementary principal of each of the selected schools was requested to complete the Elementary Administrative Questionnaire and was also personally interviewed.

The answers to the questionnaires were of the multiple choice type and were recorded on IBM porta-punch cards. Since the porta-punch cards are answered on a letter basis, it was necessary to place a value on each question and transfer data from the porta-punch cards to IBM/360 Assembler Coding forms. Data from the coded forms was then punched on computer cards and run on Burroughs B3506 equipment. Standard correlational statistical procedures were used as described in Fundamental Statistics in Psychology and Education, J. P. Guilford, 1965. The significance of correlations for the degree of freedom appropriate to elementary teachers and administrators were interpolated from Table D in Guilford. The correlations were calculated in accordance with a program entitled MULR04, which was taken from Appendix B in the book, Research Design in the Behavioral Sciences - Multiple Regression Approach by Francis J. Kelley, et al. (Southern Illinois University Press, 1969.)

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Determination of the significance of the correlation for the various tests was as follows: (1) for Basic Elementary Teacher Questionnaire (df=235) .130, $p < .05$; .170, $p < .01$; and (2) for Elementary Administrative Questionnaire (df=24) .388, $p < .05$; $p < .01$.

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PART I - ELEMENTARY

CHAPTER 3 - RESULTS

HYPOTHESES TESTED - TEACHER FACTORS

This study was designed to test the following null hypotheses related to teacher factors in the implementation of innovative science programs in the elementary schools:

Hypothesis 1. The correlation between the occurrence of innovative science programs and the kinds of college science laboratories experienced by the elementary teacher is not significant.

Hypothesis 2. The correlation between the occurrence of innovative science programs and the degree of understanding of such programs is not significant.

Hypothesis 3. The correlation between the occurrence of innovative science programs and the teacher's tendency to perceive other people and their behavior as dependable and helpful is not significant.

Hypothesis 4. The correlation between the occurrence of innovative science programs and the teacher's perception of the teaching assignment as freeing rather than controlling is not significant.

Hypothesis 5. The correlation between the occurrence of innovative science programs and the teacher's confidence in his ability to teach specific areas of science content, such as electricity and magnetism, energy and matter, friction and machines, and sound is not significant.

Hypothesis 6. The correlation between the occurrence of innovative science programs and the number of days per week spent in science laboratories is not significant.

Hypothesis 7. The correlation between the occurrence of innovative science programs and the fact that the teacher has never requested of his administrator permission to implement an innovative program is not significant.

Hypothesis 8. The correlation between the occurrence of innovative science programs and the annual average expenditure for science equipment is not significant.

Hypothesis 9. The correlation between the occurrence of innovative science programs and the annual average expenditure for science supplies is not significant.

TABLE I

Summary of Results of the Correlation of
Elementary Teacher Factors with the
Occurrence of Innovative Science Programs

Hypothesis Tested	Correlation	Significance	Results
1	0.1522	p < .05	Rejected
2	0.2794	p < .01	Rejected
3	0.1321	p < .05	Rejected
4	0.1657	p < .05	Rejected
5(Electricity and Magnetism	0.1522	p < .05	Rejected
(Energy and Matter	0.1312	p < .05	Rejected
(Friction and Machines	0.1335	p < .05	Rejected
(Sound	0.1445	p < .05	Rejected
6	0.2555	p < .01	Rejected
7	0.4536	p < .01	Rejected
8	0.3187	p < .01	Rejected
9	0.3560	p < .01	Rejected

An analysis of elementary teacher variables revealed a number of correlations which were very close to the required value of 0.130 necessary to obtain a p value of less than .05. It is desirable that some of these be considered because of their close approximation to statistical significance.

Teachers who took courses in physics and earth science are more inclined to use new programs (0.1268); those teachers who had science courses in college in which 60% or more of the time was devoted to science which could be taught at the elementary level tended toward a positive correlation value which indicates that persons with this background are more apt to implement new programs (0.1276); those teachers who are more concerned with people than things, who perceive people as able rather than unable, and who perceive their teaching task as encouraging process rather than achieving goals exhibit a strong tendency as potential users of new programs (0.1188, 0.1245, and 0.1268); and finally, teachers who feel their administrators' attitude is supportive tend toward implementation of innovative techniques (0.1124).

HYPOTHESES TESTED - ADMINISTRATIVE FACTORS

Elementary administrator factors stated as null hypotheses were:

Hypothesis 1. No significant correlation exists between the use of innovative programs and administrative support for the project.

Hypothesis 2. The correlation between the occurrence of innovative science programs and increased financial support is not significant.

Hypothesis 3. The correlation between the occurrence of innovative

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science programs and community involvement in science as a mitigating factor is not significant.

Hypothesis 4. The correlation between the occurrence of innovative science programs and the departmentalization of science curricula is not significant.

Hypothesis 5. The correlation between the occurrence of innovative science programs and the attitude of the administrator toward new curricula in science is not significant.

Hypothesis 6. The correlation between the occurrence of innovative science programs and the administrator's perception of the manner in which college training prepares elementary teachers to teach science is not significant.

Hypothesis 7. The correlation between the use of innovative programs and the number of periods science is taught per week in the schools investigated is not significant.

There is one variable which was not of statistical significance but which approached significance at .05 level. This concerned the tendency of administrators to foster the implementation of new programs when both professional education and academic science courses were taught to prospective administrators by means of appropriate laboratories (0.3675 and 0.3063).

TABLE II

Summary of Results of the Correlation of Elementary Administrator Factors with the Occurrence of Innovative Science Programs

Hypothesis Tested	Correlation	Significance	Results
1	0.0474	NS	Not rejected
2	0.2856	NS	Not rejected
3	0.1926	NS	Not rejected
4	0.3833	$p < .05$	Rejected
5	0.4729	$p < .05$	Rejected
6	0.4368	$p < .05$	Rejected
7	0.4955	$p < .01$	Rejected

DISCUSSION OF ELEMENTARY TEACHER FACTORS

The demographic profile of the elementary teachers involved in the basic elementary and interview in-depth questionnaires indicates that they represent a reasonably uniform sample of all elementary grade levels. (Kindergarten 7%; first grade 12%; second grade 18%; third grade 11%, fourth grade 16%; fifth grade 15%; sixth grade 17%; and the seventh grade 4%.) Elementary teaching certificates were held by 86% of the teachers,

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12% held secondary certificates, while 2% were not certified. Of the teachers in the sample, 84% held Baccalaureate degrees, 14% Master of Arts degrees in Education and 2% held no degrees. Ninety-four percent of the teachers were female and 6% were male. The range of teacher experience indicates that 39% have taught five years or less, 14% six to ten years, 11% eleven to fifteen years, 8% sixteen to twenty years and 25% more than twenty years. Their ages ranged: from twenty to thirty 41%, thirty-one to forty 13%, forty-one to fifty 12%, fifty-one to sixty 24% and sixty-one to seventy 10%.

Null hypothesis No. 1 was rejected since there was a significant correlation between the occurrence of innovative science programs and the kinds of college science laboratories experienced by the elementary teacher in her academic program at the level of $p < .05$. It is interesting to note that 70% of the teachers in the sample specialized in elementary education, while 12% had an area of concentration in secondary education. Forty-four percent of the teachers report that their science academic preparation prepared them poorly or not at all for teaching science in the elementary school, while 44% felt that their science preparation was adequate and 13% that they were extremely well prepared. When asked to describe their personal opinion in rating their college science content courses, only 38% of the respondents felt that the college science content courses had been helpful to them in teaching the elementary science courses which were their major responsibility. In general, the teachers felt that the type of science academic courses which are customarily required of elementary teachers do not adequately prepare them for the role of science teacher in the elementary classroom. The data also reflects that those teachers who had science courses in college in which 50% or more of the time was devoted to science which could be taught at the elementary level tend toward a positive correlation value which indicates that persons with this type of background are more apt to implement innovative programs, (0.1276).

Null hypothesis No. 2 is rejected at the level of $p < .01$. This indicates that there is a significant difference between the occurrence of innovative science programs and the teacher's degree of understanding of such programs. Since 81% of the teachers responding obtained their methods courses in college, and an additional 12% in in-service or extension courses, it is obvious that most methods courses are an integral part of the college curricula. Methods courses taught by the colleges have resulted in the following data: Of the eight widely distributed curricula of innovative types which were dealt with by the questionnaire, an average of 59% acknowledged that they had a poor understanding of the rationale and operation of innovative techniques.

That the new innovative programs are not being used in northeast Missouri is obvious since there are only twenty-one teachers out of 236 interviewed who are using innovative programs on a full-time basis. These are concentrated in six schools and fifteen of the twenty-one teachers are located in one school system. Additional data concerning innovative programs reveals that 41% of the teachers are still using standard science text books, 14% a combination of science text books and less than 10% of the sample surveyed are using a nationally developed program text. Of the

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twenty-one individuals using innovative science programs, only 35% are teaching science five days per week.

Null hypotheses No. 3, 4 and 5 are all rejected at the level of $p < .05$. This indicates that there is a significant correlation between the occurrence of innovative science programs and the teacher's feeling of adequacy and confidence in her ability to teach science at the elementary school level. It is especially interesting to note that in the areas of certain physical science concepts, such as electricity and magnetism, energy and matter, friction and machines, and sound, that the teacher's feeling of confidence contributes in a positive way toward the utilization of innovative programs. Although there is no significant correlation between the frame of reference emphasized in teaching and the occurrence of a feeling of adequacy, there is a positive tendency toward significance on the part of those teachers who are more concerned with people than things, those who perceive people as able rather than unable, and those who encourage processes rather than achievment of goals in teaching.

Twenty-four of the twenty-five elementary principals interviewed concur in their observation that the average elementary teacher is most inclined to eliminate science in the daily repertoire in preference to the elimination of any other subject matter. This indicates, we believe, that since teachers tend to feel inadequate and lack confidence in their ability to teach science, they are more willing to forgo this task upon the slightest opportunity.

Null hypothesis No. 6 is rejected at the level of $p < .01$. This significant correlation might be interpreted as indicating that those teachers who spend more time in science laboratories are more apt to be involved in innovative science programs. It might also mean that the teachers of innovative programs spend more time in laboratory exercises because this is the type of technique inherent in innovative elementary science programs.

Null hypothesis No. 7 is rejected at the level of $p < .01$, which establishes a relationship between the teacher's desire to implement an innovative program and the teacher's request for such permission. Other data indicates that principals are usually amenable to the requests of teachers. Perhaps the lesson to be learned here is that teachers should be taught how to communicate with their principals on curriculum issues.

Null hypotheses No. 8 and 9 are rejected at the level of $p < .01$, indicating that there is a definite relationship between the occurrence of innovative science programs and the annual average expenditure for science equipment and for science supplies. It requires money for equipment and supplies to operate these new programs. Interviews with teachers and principals indicate that principals tend, for the most part, to rely upon the professional evaluation of the teacher in recommending new programs. Only in one school out of the thirty examined was the principal the main force in getting a new program in operation. Most principals tend to feel that unless the teacher is willing to ask for the program, to make a strong case for the expenditure of additional funds, they are not going to impose upon their faculty such a radically different new approach to teaching science.

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DISCUSSION OF ELEMENTARY ADMINISTRATOR FACTORS

Elementary administrators' null hypotheses No. 1, 2 and 3 were not rejected since the correlation coefficients were not significant. This data conflicts with the data obtained for hypotheses No. 7, 8 and 9 of the teachers' questionnaire. This lack of significant correlation values probably results from the method of calculation used for these hypotheses. As pointed out previously, only six schools of the thirty use innovative programs, only twenty-one of the 236 utilize innovative techniques, and of the twenty-one involved fifteen are concentrated in one school system. The relatively low number of principals who are involved in innovative technique programs obviously creates a statistical problem since this sample size is not considered, per se, but statistics were based upon the total number of principals answering questions on the project. Frequency data shows that 48% of the principals interviewed have never requested of their teachers that they use innovative type of science teaching in their classrooms, since a number of principals report that their superintendents rejected the idea on the basis of cost or simply because they do not believe in the new philosophy of innovative teaching of science. The science academic preparation of elementary principals in the sample also indicates that 52% would describe their laboratory experiences in science as either "cook book" or highly conventional, and only 19% report having laboratory experiences that were mostly "inquiry" or open ended. Forty-eight percent report no laboratory experiences in their college education science methods courses, 15% an occasional laboratory and 22% of the group reported only one-fourth of the time was spent in laboratory procedures. They also indicate that in their college professional education science courses, 60% had either no laboratories or only occasional laboratories, and an additional 14% spent less than one-fourth of the time in laboratory experiences. Since many elementary majors are allowed to count general education science as part of their science requirement, it is also interesting to note that 46% of the principals listed as "cook book" or highly conventional their laboratory experiences in general education courses. It is also pertinent to report that the principals rated the degree to which college training prepared the average teacher to teach science in the following manner: very well 4%, adequately 33%, poorly 52%, and not at all 4%. Specifically, in rating professional education courses, they listed them as: most helpful 18%, helpful 36%, somewhat helpful 14%, and not at all helpful 32%.

Null hypothesis No. 2 for the administrators questionnaire concerned itself with increased financial support and this was not rejected. This is further substantiated by data which shows that 78% of the principals reported spending less than an average of $100 per year for the past three years. Equipment expenditures were indicated as: 56% less than $50 for equipment, and 77% less than $50 for science supplies on an average during the past three years.

Null hypothesis No. 3 was not rejected, which indicates that there is no significant correlation between the community involvement and the types of science programs offered.

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Null hypothesis No. 5 was rejected which indicates that there was a definite correlation between the attitude of the administrator toward new science programs and implementation of innovative techniques. This correlation is rather difficult to explain but perhaps a review of the attitude of the administrators as outlined above would throw some light upon this matter. This positive correlation between innovative science programs and the attitude of the administrator toward new curricula in science is apparently closely associated with hypothesis No. 4 which shows a correlation between innovative science programs and the tendency to departmentalize science curricula. It is also probably related to hypothesis No. 7 which was also rejected and therefore shows a positive correlation between innovative science programs and the number of periods science is taught per week in the schools in which the new science programs are being used. Very likely the rejection of hypothesis No. 6, which relates correlation of the occurrence of innovative science programs with the administrator's perception of the manner in which college training prepares elementary teachers to teach science, has a bearing upon the situation. It is possible that since many administrators do not feel their teachers are well qualified to teach science, they are unwilling to insist upon their use of innovative science programs.

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PART I - ELEMENTARY

CHAPTER 4 - CONCLUSIONS

The following elementary teacher variables are significantly related to the occurrence of innovative science programs: (1) the type of college science academic and science methods preparation of the teacher; (2) the teachers' feelings of adequacy and confidence in teaching science; and (3) the administrative encouragement and support of the new science programs.

Thus, if a school system should seriously consider adopting innovative science curricula: (1) the college curriculum in science should be changed to include open-ended or "inquiry" science laboratories and the basic science taught should be suitable and appropriate for use in the elementary schools; (2) the college methods courses in science should teach the new programs as a natural part of the laboratories of science methodology; (3) prospective teachers should be taught in such a fashion as to be confident of their ability to handly science concepts at the level of elementary school classrooms. Confidence is one of the main factors that is essential to a feeling of adequacy. (4) In order for the administrator to be adequately prepared to encourage and assist the teacher to implement new science programs, his college curriculum should include a background in science concepts and recent science methodology. (5) Teachers should be taught how to effectively request assistance from the administrator.

As indicated by the correlations and frequency data from the elementary administrative questionnaire, the following variables are related to the occurrence of innovative science programs: (1) the administrators' encouragement and assistance to teachers is a factor in the implementation and utilization of innovative science programs; and (2) administrative financial support has a positive tendency toward correlation in implementing innovative science programs. The presence of positive administrative attitudes toward innovative programs would increase the chance of their being implemented.

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ABSTRACT

PART II - SECONDARY

This study was designed to identify and quantify factors which have been successful in the implementation of innovative science programs in the science classrooms of rural secondary schools in northeast Missouri. Thirty-one secondary schools in the twenty-five county area were investigated. Multiple choice questionnaires and personal interviews were analyzed using the MULR04 correlation procedure. Teacher factors identified as affecting implementation of innovative programs are the effect of college science content courses and science methods courses, the teachers' feelings of adequacy in teaching science, and the effect of administrative encouragement and the necessary financial support. Administrator factors identified are the administrators' role in initiating the programs and encouraging the teachers, the necessity of financial support, and the relationship between the administrators' science background and their knowledge of the rationale and operation of innovative curricula.

Based upon factors identified, science courses for secondary teachers should contain concepts appropriate for use in secondary school teaching, should include inquiry-oriented laboratory activities, and should include a study of innovative curricula as an integral aspect of science methodology courses.

If these course objectives are attained, secondary school teachers will teach science confidently and effectively. Similarly, if administrators are exposed to science content and methodological courses based upon the objectives and rationale of innovative science programs they will be better able to assist in the implementation of innovative science curricula.

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PART II - SECONDARY

CHAPTER 1 - INTRODUCTION

THE PROBLEM

Complete descriptions of the problem, definition of terms and statement of objectives are detailed in the portion entitled Part I - Elementary.

LIMITS OF THE STUDY

In the twenty-five counties which comprise the northeast quarter of the State of Missouri, there are 102 secondary schools which are currently supervised by 263 secondary principals, assistant principals, and/or superintendents. These secondary schools employ 2,786 teachers and have a total enrollment of 45,531 secondary students.* These twenty-five counties contain ninety-five separate school districts. The number of separate legal school districts varies from nine districts in Boone County to one each in Knox, Ralls, and Schuyler Counties.

Thirty-one secondary schools were randomly selected from the aforementioned counties of northeast Missouri. Sixty-five secondary teachers completed the Basic Secondary Questionnaire. Thirty-four randomly selected teachers from this group completed a second questionnaire, the Secondary Teacher Interview In-Depth. Forty-six principals and/or superintendents of the participating secondary schools completed the Secondary Administrative Questionnaire.

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*Data compiled from Missouri School Directory 1972-1973, State Board of Education, Arthur L. Mallory, Commissioner of Education.

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PART II - SECONDARY

CHAPTER 2 - PROCEDURES

Using the technique of random selection, at least one secondary school was selected from each of the twenty-five counties in northeast Missouri. An additional six selections were drawn at random from the total number remaining in the pool. Each school was visited by an interviewer, who distributed a Basic Secondary Teacher Questionnaire to each science teacher and a Secondary Teacher Interview In-Depth Questionnaire to a second group of teachers randomly selected from the basic group. Teachers who completed the Secondary Teacher Interview In-Depth were individually interviewed to determine if there was information which needed to be considered but had not been included in the first two questionnaires.

The Basic Secondary Teacher Questionnaire was designed to (1) collect pertinent demographic data concerning grade level taught, age, degree(s), and number of years and type of teaching experience, (2) to determine if the teachers were using innovative programs in science and the extent to which the programs were being used, (3) the manner in which information about the new programs had been acquired, (4) the teacher's personal evaluation of the impact science academic and educational methods courses had upon her teaching, (5) the teacher's feeling of adequacy in teaching science, and (6) the relationship between the principal and the community in the establishment of new programs.

The Secondary Teacher Interview In-Depth was designed to obtain additional information regarding (1) the method whereby science background knowledge was obtained, (2) the teacher's feeling of adequacy in teaching science, (3) the teacher's method of conducting classes, (4) the type of science library facilities, (5) the availability of audio-visual equipment for science use, (6)the time available for science teaching, and (7) the effect of curriculum at the college level as it relates to science teaching.

The secondary principal and/or superintendent of each of the selected schools was requested to complete the Secondary Administrative Questionnaire and was also personally interviewed.

The answers to the questionnaires were of the multiple choice type and were recorded on IBM porta-punch cards. Since the porta-punch cards were answered on a letter basis, it was necessary to place a value on each question and transfer data from the porta-punch cards to IBM/360 Assembler Coding forms. Data from the coded forms was then punched on computer cards and run on Burroughs B3506 equipment. Standard correlational statistical procedures were used as described in Fundamental Statistics in Psychology and Education, J. P. Guilford, 1965. The significance of correlations for the degrees of freedom appropriate to secondary teachers and administrators were interpolated from Table D in Guilford. The correlations were calculated in accordance with a program entitled MULR04, which was taken from Appendix B

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in the book, Research Design in the Behavioral Sciences - Multiple Regression Approach by Francis J. Kelley, et al. (Southern Illinois University Press, 1969.)

Determination of the significance of the correlation for the various tests was as follows: (1) for Basic Secondary Teacher Questionnaire – (df=65) .242, $p < .05$; .313, $p < .01$; and (2) for Secondary Administrative Questionnaire (df=45) .285, $p < .05$; .369, $p < .01$.

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PART II - SECONDARY

CHAPTER 3 - RESULTS

HYPOTHESES TESTED - TEACHER FACTORS

This study tested the following null hypotheses related to teacher factors in the implementation of innovative science programs in the secondary schools:

Hypothesis 1. The correlation between the occurrence of innovative science programs and the type of degree held by the teacher is not significant.

Hypothesis 2. The correlation between the occurrence of innovative science programs and those teachers with eleven to fifteen hours of chemistry credit is not significant.

Hypothesis 3. The correlation between the occurrence of innovative science programs and the teacher's knowledge of Biological Science Curriculum Studies - Yellow Version is not significant.

Hypothesis 4. The correlation between the occurrence of innovative science programs and the teacher's knowledge of Biological Science Curriculum Studies - Blue Version is not significant.

Hypothesis 5. The correlation between the occurrence of innovative science programs and the teacher's knowledge of Chemical Education Materials is not significant.

Hypothesis 6. The correlation between the occurrence of innovative science programs and the teacher's knowledge of Chemical Bond Approach is not significant.

Hypothesis 7. The correlation between the occurrence of innovative science programs and the teacher's knowledge of Introductory Physical Science is not significant.

Hypothesis 8. The correlation between the occurrence of innovative science programs and the receipt of Biological Sciences Curriculum Studies literature by the teacher is not significant.

Hypothesis 9. The correlation between the occurrence of innovative science programs and the receipt of Chemical Education Materials literature by the teacher is not significant.

Hypothesis 10. The correlation between the occurrence of innovative science programs and the number of periods innovative science is taught per week is not significant.

Hypothesis 11. The correlation between the occurrence of innovative science programs and the approximate length of the innovative science period is not significant.

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Hypothesis 12. The correlation between the occurrence of innovative science programs and the time devoted to science labs on a weekly basis is not significant.

Hypothesis 13. The correlation between the occurrence of innovative science programs and the teacher's feeling of adequacy in teaching chemistry is not significant.

Hypothesis 14. The correlation between the occurrence of innovative science programs and administrative support and encouragement is not significant.

Hypothesis 15. The correlation between the occurrence of innovative science programs and the administrative financial support for science equipment is not significant.

Hypothesis 16. The correlation between the occurrence of innovative science programs and the administrative financial support for science supplies (expendables) is not significant.

Hypothesis 17. The correlation between the occurrence of innovative science programs and community support for innovative science programs is not significant.

TABLE III

Summary of Results of the Correlation of Secondary Teacher Factors with the Occurrence of Innovative Science Programs

Hypothesis Tested	Correlation	Significance	Results
1	0.2539	$p < .05$	Rejected
2	0.3927	$p < .01$	Rejected
3	0.3082	$p < .05$	Rejected
4	0.2721	$p < .05$	Rejected
5	0.4493	$p < .01$	Rejected
6	0.2626	$p < .05$	Rejected
7	0.3020	$p < .05$	Rejected
8	0.3306	$p < .01$	Rejected
9	0.2645	$p < .05$	Rejected
10	0.4440	$p < .01$	Rejected
11	0.4382	$p < .01$	Rejected
12	0.4047	$p < .01$	Rejected
13	0.5122	$p < .01$	Rejected
14	0.3678	$p < .01$	Rejected
15	0.3699	$p < .01$	Rejected
16	0.3258	$p < .01$	Rejected
17	0.2676	$p < .05$	Rejected

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DISCUSSION OF SECONDARY TEACHER FACTORS

A demographic profile of the secondary teachers involved in the report indicates that 74% of the science teachers in the sample were male and 23% were female. Sixty percent of those interviewed were under thirty years of age, 14% between thirty-one and forty, 17% between forty-one and fifty, while the remainder were more than fifty years of age. Master's degrees (most were Master of Arts in Education), accounted for 35% of the group, 33% held Bachelor of Science in Education degrees, and 30% held the Bachelor of Science degree. The range of teacher experience indicates that 58% have taught five years or less, 16% six to ten years, and 13% eleven to fifteen years, while only six teachers or 10% of the sample have taught twenty years or more. Life certificates were held by 87% of the respondent group (in the past, life certification was automatic with the granting of the Bachelor of Science in Education degree in Missouri), and three teachers held limited academic or "examination certificates" because they did not have the required number of hours in professional education courses. Six teachers reported that they were teaching science but did not hold a certificate in any science area.

One rather amazing statistic which arose from the general demographic profile is that 73% of the science teacher respondents report they are deeply committed to the concept that all educated people must be scientifically literate. The remaining 27%, however, either oppose or report indifference to this committment.

Null hypothesis No. 1 is rejected which indicates that the type of degree held by the teacher is a factor in the implementation of innovative science programs in secondary schools. Frequency data reports that of the eleven teachers who are utilizing innovative techniques, five hold Master's degrees and six hold Bachelor of Science in Education degrees. This might be construed as indicating these two types of degree are advantageous in the preparation of innovative teachers of science.

Null hypothesis No. 2 is rejected, at the level of $p < .01$, which indicates that those teachers with more than ten hours of academic credit in chemistry are more willing to participate in innovative science teaching, when compared with teachers who have an equal number of college science credits in general education science, biology, earth science, and physics.

Null hypotheses No. 3, 4, 5, 6, and 7 are all rejected at the level of $p < .05$, or $p < .01$. This indicates that each teacher of an innovative science course has a basic knowledge of the materials with which he is working. It is interesting to note, however, that frequency data records that 60% of all of the respondents have little or no knowledge of Biological Science Curriculum Study - Yellow Version, 53% report little or no knowledge of the Biological Science Curriculum Study - Blue Version; 86% similarly report little or no knowledge of Biological Science Curriculum Studies - Slow Learners' Version, 71% little or no knowledge of Biological Science Curriculum Study - Biological Inquiry, Advanced Version. Little or no knowledge was reported by 77% concerning Harvard Projects Physics curriculum, 67% for the Chemical Education Materials curriculum,

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77% for the Chemical Bonds Approach, 55% for Introductory Physical Science and 85% for the Intermediate Curriculum Study. This indicates rather conclusively that teachers who have little or no knowledge of innovative curricula do not teach innovative programs.

The rejection of hypotheses No. 8 and 9 suggests the lack of knowledge of innovative programs, since it relates to the receipt of current literature of innovative programs now available commercially. Only 48% (thirty-three teachers) of the respondents answered this question and of those who answered, six are receiving literature regarding Introductory Physical Science, nine receive literature on Biological Science Curriculum Study, and three on Chemical Education Materials.

Null hypotheses No. 10, 11 and 12 are concerned with the length and number of periods per week devoted to innovative science laboratories. Frequency data indicates that only eleven (17%) of the respondents are utilizing any version of the Biological Science Curriculum program and only one class was making use of the Advanced Version. In the area of physical sciences, twelve (19%) of the individuals reported making use of an innovative technique. In-Depth Interviews revealed that at least four of the teachers using biological innovation are also using physical science innovation. These data are consistent with the frequency distribution which indicates that only eleven teachers of the sixty-five responding are using innovative science text books.

Null hypothesis No. 13 is rejected at the level of $p < .01$. This apparently indicates that chemistry teachers tend to rate themselves as being more able to teach their subject (i.e. chemistry) than do teachers of biology, general science, physical science or physics.

Null hypothesis No. 14 concerns administrative support and was rejected at the level of $p < .01$. This indicates, as might be expected, that administrative support and approval is essential for any curriculum change.

Null hypotheses No. 14, 15 and 16 are all rejected, which indicates that those teachers who are participating in innovative science programs report a high degree of cooperation, both in the form of encouragement and in the expenditure of school funds for the necessary equipment and expendable supplies. Teachers not involved in innovative programs report that considerably less financial support is applied to their needs. Replies indicate that 52% of the respondents are allowed less than $150.00 per year for equipment, while 64% are allowed less than this amount for expendable supplies.

Null hypothesis No. 17 is rejected at the level of $p < .05$. This data supports the need of involvement of the community in curriculum change. The effect of community support for better science teaching is reported by 72% of those engaged in innovative programs. It must be noted, however, that numerically this applies to only eight teachers who feel that the community is a factor in the improvement of science curricula.

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In response to the question, "Where did you obtain your information about innovative science curricula," only forty (71%) responded. Of those who responded, eleven had attended institutes, ten received the information through regular college classes and nineteen learned about innovative programs through personal study. This indicates that the 67% of the science teachers who responded have not attended science institutes. In-Depth interviews report that there have been very few opportunities for teachers to attend institutes or workshops which are designed for high school use in our area. Twenty of the respondents would prefer to study innovative science programs through workshops or in-service institutes held locally, while nineteen would perfer workshops or institutes held on college campuses for two or three weeks during the summer.

The questionnaire provided information that twenty-nine teachers in the sample (56%) are continuing to use standard text books, eleven (22%) are using commercially prepared innovative text books, five (10%) are using a combination of innovative and standard text books, while seven (12%) of the respondents are using material which they are producing, themselves, in mimeograph form.

HYPOTHESES TESTED - ADMINISTRATOR FACTORS

The following null hypotheses related to secondary administrative factors in the implementation of innovative science programs in the secondary schools are stated herewith:

Hypothesis 1. The correlation between the occurrence of innovative science programs and receipt of Biological Science Curriculum Study - Green Version literature is not significant.

Hypothesis 2. The correlation between the occurrence of innovative science programs and receipt of literature concerning Biological Science Curriculum Study - Biological Inquiry, Advanced Version is not significant.

Hypothesis 3. The correlation between the occurrence of innovative science programs and receipt of Chemical Education Materials literature is not significant.

Hypothesis 4. The correlation between the occurrence of innovative science programs and receipt of Intermediate Science Curriculum Study literature is not significant.

Hypothesis 5. The correlation between the occurrence of innovative science programs and an administrator's favorable reaction to new science programs is not significant.

Hypothesis 6. The correlation between the occurrence of innovative science programs and the number of class periods per week during which innovative science is taught is not significant.

Hypothesis 7. The correlation between the occurrence of innovative science programs and the approximate length of the period in which innovative science is taught is not significant.

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Hypothesis 8. The correlation between the occurrence of innovative science programs and the time devoted per week to innovative science laboratories is not significant.

Hypothesis 9. The correlation between the occurrence of innovative science programs and the support received from the community for innovative science programs is not significant.

Hypothesis 10. The correlation between the occurrence of innovative science programs and the number of hours of college science credit on the administrator's transcript is not significant.

Hypothesis 11. The correlation between the occurrence of innovative science programs and whether or not the administrator has ever requested his teachers to implement new innovative programs is not significant.

Hypothesis 12. The correlation between the occurrence of innovative science programs and the administrative support provided the teacher in establishing a new innovative curriculum is not significant.

Hypothesis 13. The correlation between the occurrence of innovative science programs and the average expenditure per class for science equipment during the last three years is not significant.

Hypothesis 14. The correlation between the occurrence of innovative science programs and the average expenditure allowed per class for science supplies during the last three years is not significant.

Hypothesis 15. The correlation between the occurrence of innovative science programs and the amount of time devoted to laboratory experiences in general education science classes taken by the administrator is not significant.

Hypothesis 16. The correlation between the occurrence of innovative science programs and the amount of time devoted to laboratory experiences in college content course(s) by the administrator is not significant.

Hypothesis 17. The correlation between the occurrence of innovative science programs and the amount of time devoted to laboratory experiences in professional education science course(s) taken by the administrator is not significant.

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TABLE IV

Summary of Results of the Correlation of Secondary Administrator Factors with the Occurrence of Innovative Science Programs

Hypothesis Tested	Correlation	Significance	Results
1	0.2670	NS	Not Rejected
2	0.2593	NS	Not Rejected
3	0.3948	p < .01	Rejected
4	0.2919	p < .05	Rejected
5	0.5035	p < .01	Rejected
6	0.8068	p < .01	Rejected
7	0.7005	p < .01	Rejected
8	0.3619	p < .05	Rejected
9	0.3092	p < .05	Rejected
10	0.3713	p < .01	Rejected
11	0.3194	p < .05	Rejected
12	0.5944	p < .01	Rejected
13	0.3182	p < .05	Rejected
14	0.4319	p < .01	Rejected
15	0.2880	p < .05	Rejected
16	0.3497	p < .05	Rejected
17	0.4243	p < .01	Rejected

DISCUSSION OF SECONDARY ADMINISTRATOR FACTORS

A total of forty-six administrators, which included both principals and superintendents comprised the sample for the Secondary Administrative questionnaire. Twenty-eight of these administrators hold a Master's degree or beyond. Seventy-six percent of these administrators have more than ten years of teaching experience. Fifty-seven percent were more than forty years of age and only one was a female. Data indicates that only eleven of the total of forty-six had ever taught science in the public schools, however, thirty-six (78%) had five credit hours or more of chemistry, thirty-four (73%) had one or more courses in physics, and thirty-two (70%) had one or more courses in earth science, while thirty-five (76%) had some type of college course in biology. While this does not insure a very great depth in knowledge of science, nevertheless it does indicate that most of the administrators have at least a basic knowledge of the types of science programs usually taught in public secondary schools.

Null hypotheses No. 1 and 2, the correlation between the occurrence of innovative science programs and the administrators receipt of Biological Science Curriculum Study, Green Version and Advanced Version were

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not rejected. This indicates that there is no correlation between the use of these two programs and the administrators receipt of current literature about the programs. This probably can be interpreted as resulting from the fact that there are more biology teachers than teachers of other kinds of science and may also reflect a more wide-spread distribution of knowledge about Biological Science Curriculum Study programs than exists for the other science programs.

Null hypotheses No. 3 and 4 were rejected which indicates that those administrators whose teachers are utilizing innovative curricula in science are also currently receiving literature about these programs.

While hypotheses No. 1 and 2 are not rejected their correlation values were very close to $p < .05$ which leans strongly toward support of the general premise that those administrators receiving innovative curriculum literature are more apt to support this type of innovation in their schools. This does not answer the question of whether literature is also being received by the administrators whose science teachers are not involved in innovative science teaching.

It should also be noted that no more than four administrators have ever attended an institute in innovative science curricula, while only one had attended an innovative science workshop.

Null hypothesis No. 5 which concerns administrators' favorable reaction to new science programs also was rejected. The significance of this factor is further supported by frequency data which reveals that forty-three percent of the respondents are neutral to new science programs and that fifty-nine percent have never requested their teachers to change to new science programs. Personal interviews with administrators indicate that most administrators tend to rely very heavily on the teachers preferences for the type of program in the science area. Only two administrators report insisting that teachers follow innovative programs, while eight advised that the teachers use innovative techniques.

Null hypotheses No. 6, 7 and 8 are all rejected. These hypotheses concern the number of class periods per week, the approximate length of the class periods, and the time devoted to innovative science laboratories. This may be construed as support by the administrator for teachers in utilizing innovative science curricula, since these factors are all decided by the administrator. This may indicate recognition by the administrator of the time requirements essential for teaching innovative science.

Null hypothesis No. 10 relates to the occurrence of innovative science programs and the total number of college science credits on the administrator's transcript. It indicates that those administrators with the strongest background in science are usually more aware of the problems of the science teacher as related to utilizing new techniques of an innovative nature.

Null hypothesis No. 11 attempts to establish a relationship between the occurrence of innovative science programs and the administrators' positive attitude for innovative curricula in science. This correlation

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supports the personal interviews with administrators in indicating that most administrators tend to rely almost completely upon the recommendations of their science faculty for changes in curriculum. However, if the administrator has a strong interest in new curricula--strong enough to suggest its use in the science department--the teachers apparently are responsive to this interest and support.

Null hypothesis No. 12 is rejected which indicates that the teachers are sensitive to, and tend to respond to, administrative support for the establishment of innovative science programs.

Null hypotheses No. 13 and 14 deal with the cash expenditures allowed the science teacher for science equipment and science supplies. The rejection of these hypotheses tends to support the assumption that without financial support innovative programs cannot be undertaken.

Null hypotheses No. 15, 16 and 17 are all rejected at the level of $p < .05$ or $p < .01$. All three of these hypotheses deal with the relationship between the occurrence of innovative science programs and the amount of time devoted by the administrators to laboratory experiences in general education science courses, college content science courses and professional education courses in science. They support the probability that administrators with strong backgrounds in laboratory oriented courses in science will tend to be supportive of innovative science curricula.

Null hypothesis No. 9 establishes a positive relationship between the community involvement in science programs and the administrators' willingness to move in this direction. It should be pointed out, however, that this correlation involves a limited number of schools participating in innovative science offerings.

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PART II - SECONDARY

CHAPTER 4 - CONCLUSIONS

The following teacher variables are significantly related to the occurrence of innovative science programs: (1) those teachers holding a Master's degree are more apt to engage in innovative science curriculum projects; (2) basic knowledge of innovative programs and receipt of current literature concerning these programs is beneficial; (3) curricula which emphasizes both the length and number of periods per week of innovative science laboratories is a positive factor in the use of innovative programs; (4) chemistry teachers in general and all science teachers with ten hours credit in chemistry tend to be more confident of their ability in teaching innovative science programs; (5) the teachers apparently need administrative support and encouragement as well as financial support to engage in innovative programs; and (6) community involvement is definitely a favorable factor in the implementation of innovative science curricula.

Should a school system seriously consider adopting innovative science curricula for the secondary school: (1) personnel whould be selected whose college curriculum in science includes open-ended science laboratories and basic science concepts appropriate for the secondary student; (2) college methods courses in science of the selected personnel should include innovative programs as an integral part of their science laboratories; and (3) the teachers should have been taught in such a way that they are confident not only of their science content ability but also of their ability to transmit concepts to secondary students. The teachers confidence in his ability to communicate effectively in the realm of science is essential to a feeling of adequacy. Since the data reflects a tendency on the part of administrators to follow the preferences of the teacher in science curriculum matters, these teachers should be able to effectively communicate their curriculum preferences and physical equipment needs to the administrators.

Administrator factors which indicate a direct relationship to the occurrence of innovative science programs are: (1) the receipt of current literature by the administrators regarding innovative science programs; (2) administrative support for longer and more frequent science class periods and innovative science laboratories; (3) the type of college science courses and laboratory experiences of the administrators; and (4) a positive attitude of support of innovative programs by the administrator.

Administrators tend to rely very heavily upon the recommendations of the teachers for the type of curricula taught in their school systems. The data shows significant correlation between the administrators' encouragement and financial assistance as a major factor in the implementation of innovative science programs.

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RECOMMENDATIONS

It is recommended that: (1) this study be expanded to cover the remainder of the State of Missouri; (2) the study be expanded to include a sample of urban and large city school systems; (3) a statewide conference of science educators should be convened to consider the implications of these data for curriculum changes; (4) efforts should be made for a series of conferences with public school administrators which will bring to their attention the administrators' role in implementing innovative science programs; and (5) additional efforts should be directed toward modifying the original questionnaire for use on a more wide-spread basis.

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TEACHER QUESTIONNAIRE--ELEMENTARY

SECTION I

This questionnaire for teachers who teach science is part of the data system for DHEW Research Project 2-G-023, entitled "An Analysis of Factors Successful in the Implementation of Innovative Science Programs in the Elementary and Secondary Rural Schools." We would appreciate your answering these questions as accurately and as frankly as possible. At no time will you ever be identified by name. You will be assigned a code number, decipherable only by the research team. The same security of information applies to schools and school districts.

PROCEDURE:

a. Section I, the first 60 questions, will be recorded on the yellow-banded IBM porta punch card. We suggest that you circle the selected answer in pencil and wait until the entire questionnaire is completed before punching any cards.

b. Section II of this questionnaire requires use of the red-banded porta punch card.

c. PLEASE do not place Social Security number or any other identifying marks on the porta punch cards. The researcher will personally code them when he picks up the cards from the individual teacher.

d. A few teachers in each school will be selected by random method for a second "Interview-in-Depth."

e. If a question does not apply to your situation skip question and line on card.

Items 1 and 2 (select as many categories as applicable.

1. Indicate the grade level(s) you now teach.
   A. Kindergarten B. 1st grade C. 2nd grade D. 3rd grade E. 4th grade

2. Indicate the grade level(s) you now teach.
   A. 5th grade B. 6th grade C. 7th grade D. 8th grade

* *

3. Indicate the type of certificate(s) you now hold.
   A. Life certificate B. 2-year Academic Contract Certificate C. Substitute Certificate D. 1 to 3-year Examination Certificate E. Other

4. Indicate the area(s) in which you now hold certificate.
   A. Elementary B. Junior High C. Secondary D. None

5. Indicate the type of degree(s) you now have.
   A. Master's degree or beyond B. B.S.E. C. B.S. D. B.A. E. No degree

6. How many additional semester hours of credit have you earned beyond the highest degree listed in Item 5.
   A. 0-6 B. 7-12 C. 13-21 D. 22-28 E. 29 and above

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7. Indicate the item which represents your years of teaching experience.
A. 0-5 B. 6-10 C. 11-15 D. 16-20 E. More than 20

8. Indicate the number of years since you received your first degree.
A. 0-5 B. 6-10 C. 11-15 D. 16-20 E. More than 20

9. Indicate your approximate age at the time you began teaching.
A. 20-25 B. 26-30 C. 31-35 D. 36-40 E. 41-45

10. Indicate your approximate age at the time you began teaching.
A. 46-50 B. 51-55 C. 56-60 D. 61-65 E. 66-70

11. Indicate your age when you received your first degree.
A. 20's B. 30's C. 40's D. 50's E. 60's

12. Indicate the number of years since you received your last degree.
A. 0-5 B. 6-10 C. 11-15 D. 16-20 E. More than 20

13. Indicate the number of years since you did additional course work - for a salary increment, for certification improvement, for up-dating information.
A. Presently enrolled (1 year) B. 2 years C. 3 years D. 4 years
E. 5 or more years

14. What is your approximate age? (leave blank if not applicable)
A. 20-25 B. 26-30 C. 31-35 D. 36-40 E. 41-45

15. What is your approximate age? (leave blank if not applicable)
A. 46-50 B. 51-55 C. 56-60 D. 61-65 E. 66-70

16. What is your sex?
A. Male B. Female

* *

Items 17 through 24. In the following series of innovative programs (new elementary science programs) indicate the degree of understanding you have concerning these programs.
DEFINITION OF TERMS USED: INNOVATIVE - The recently-developed science programs are referred to as innovative because emphasis is placed on a change in the established method of teaching. The programs emphasize the "inquiry," or problem-solving method of teaching rather than the traditional method of presentation of facts, laws, and theories for memorization by the student.
Key: A. Thorough B. Good C. Fair D. Little E. None

17. S-APA (Science, a Process Approach)

18. ESS (Elementary School Science)

19. MINNEMAST (Minnesota Mathematics and Science Teaching Project)

20. SCIS (School Science Improvement Study)

21. ES (Environmental Studies)

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22. IDP (Inquiry Development Program in Physical Science)

23. COPE (Conseptually Oriented Program in Elementary Science)

24. ISCS (Intermediate Science Curriculum Study)

* *

25. Where did you obtain your information about the new science program(s)?
    A. Workshop - local in evening
    B. Workshop - local on Saturday
    C. Workshop - campus Saturdays only
    D. Workshop - 2 or 3 weeks summer campus
    E. Workshop - 2 or 3 weeks local

26. Where did you obtain your information about the new science program(s)?
    A. Institutes - in-service local
    B. Institutes - Summer college campus
    C. Regular course work (college campus not workshop or institute)
    D. Extension class(es)
    E. Personal study

27. What is your reaction to these new science programs?
    A. Favorable B. Neutral C. Unfavorable

28. For which of the new science programs listed below do you currently receive literature?
    A. S-APA B. ESS C. MINNEMAST D. SCIS E. None

29. For which of the following new science programs (listed below) do you currently receive literature?
    A. ES B. IDP C. COPE D. ISCS E. Other

30. Would you be willing to participate in an innovative science program (workshop, institute, college campus, extension)?
    A. Yes B. No
    (If answer is no, skip questions 31,32, and 33.)

31. What type of additional work would you prefer for a study of innovative science programs?
    A. Workshop(s) - local or college campus
    B. Institute(s) - in-service, summer, or academic year
    C. Regular course work - college campus not workshop or institute
    D. Extension class(es)
    E. Personal study

32. Indicate your preference of a program to be covered by additional study (workshop, extension course, institute, regular course).
    A. S-APA (Science, a Process Approach)
    B. ESS (Elementary Science Study)
    C. MINNEMAST (Minnesota Mathematics and Science Teaching Project)
    D. SCIS (Science Curriculum Improvement Study)

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33. Indicate your preference of a program to be covered by additional study (workshop, extension course, institute, regular course).
A. ES (Environmental Studies)
B. IDP (Inquiry Development Program in Physical Science)
C. COPE (Conseptually Oriented Program in Elementary Science)
D. ISCS (Intermediate Science Curriculum Study)

34. If an innovative program is being used in your classroom, please indicate which one.
A. S-APA B. ESS C. MINNEMAST D. SCIS E. None of these

35. If an innovative program is being used in your classroom, please indicate which one.
A. ES B. IDP C. COPE D. ISCS E. Other, including your own innovative design

36. In your school is science being taught as a separate subject or in combination with other subjects:
A. As a separate subject (departmentalized)
B. With other subjects (self-contained classroom)

37. Type of teaching in which you are involved.
A. Team Teaching B. Modified Team Teaching C. Self-Contained
D. Departmental E. Other

38. Are you teaching science by the "inquiry" (laboratory) method?
A. Yes B. No C. Partially

39. What type of textbook are you now using in your science classes?
A. A standard science textbook
B. An innovative science textbook (developed on a national basis to be used by one of the innovative programs such as ESS, ISCS, etc.)
C. A combination of several books
D. No textbook being used
E. Textbook/materials produced by self and/or teachers of same school system

40. Leave blank.

41. Leave blank.

42. If one of the innovative science programs is being used in your school, please indicate to what extent.
A. One period per week B. Two periods per week C. Three periods per week
D. Four periods per week E. Five periods per week

43. What is the approximate length of each of the above periods? (See No. 42)
A. 15 minutes B. 20 minutes C. 25 minutes D. 30 minutes E. More

44. How much time do you devote to science laboratories on a weekly basis?
A. 1 day B. 2 days C. 3 days D. 4 days E. 5 days

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* *

Items 45 through 15 of Section II (red card) deal with the teachers feeling of adequacy and competence in the classroom. In teaching there is a strong relationship between the perceptual organization of the person and his effectiveness as a teacher.

Key: In the following thirty items please rate yourself objectively and fairly according to the following key.

A. Superior B. Excellent C. Average D. Fair E. Poor

In the general frame of reference what do you tend to emphasize in your teaching?

45. An internal rather than an external frame of reference

46. Concern with people rather than things

47. Concern with perceptual meanings rather than facts and events

48. An immediate rather than an historical view of causes of behavior

As a teacher do you tend to perceive other people and their behavior as:

49. Able rather than unable

50. Friendly rather than unfriendly

51. Worthy rather than unworthy

52. Internally rather than externally motivated

53. Dependable rather than undependable

54. Helpful rather than hindering

As a teacher do you tend to perceive yourself as:

55. With people rather than apart from people

56. Able rather than unable

57. Dependable rather than undependable

58. Worthy rather than unworthy

59. Wanted rather than unwanted

As a teacher do you tend to perceive your teaching task, your teaching assignment, as:

60. Freeing rather than controlling

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TEACHER QUESTIONNAIRE--ELEMENTARY

SECTION II

Use Key - Page 5 (This is a continuation of the group - items 45, Section I through 15, Section II)

As a teacher do you tend to perceive your teaching task, your teaching assignment, as:

1. Larger rather than smaller

2. Revealing rather than concealing

3. Involved rather than uninvolved

4. Encouraging process rather than achieving goals

5. How deeply are you committed to the necessity that all educated people must understand science

6. What effect does the principal's attitude have upon your science classes

7. Are you afraid or dislike to ask for supplies and equipment

8. How confident are you in your ability to teach electricity and magnetism

9. How confident are you in your ability to teach energy and matter

10. How confident are you in your ability to teach space travel

11. How confident are you in your ability to teach friction and machines

12. How confident are you in your ability to teach sound

13. How confident are you in your ability to teach light

14. How confident are you in your ability to teach human body

15. How confident are you in your ability to teach about plants without seeds

* *

16. I feel that the community which is served by my school system supports science in the following manner:
    A. Supportive and enthusiastically cooperative.
    B. Supportive and highly cooperative
    C. Moderately supportive and cooperative
    D. Indifferent toward science
    E. Opposes science.

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17. It is my personal feeling that my administrator's attitude toward science teaching is:
    A. He is doing all that he can to assist me in obtaining supplies and equipment
    B. He is moderately cooperative
    C. He is noncommital
    D. He is indifferent
    E. He opposes science teaching

18. I feel that my administrator's attitude toward my science program is:
    A. Highly supportive and cooperative
    B. Highly supportive financially
    C. Enthusiastically cooperative
    D. Antagonistic toward science

* *

Items 19 through 31 deal with self-evaluation by use of qualities that are usually associated with the science teaching profession. An individual who is mature and who approaches this with objectivity and fairness can do an excellent job of self-evaluation Use the following key in evaluating yourself:

Key: A. Superior B. Excellent C. Average D. Fair E. Poor

19. Personal appearance: Evidence of propriety and good taste, neatness, cleanliness, and general attractiveness.

20. Poise: Ease and naturalness, carriage, and self possession.

21. Tact and courtesy: Ability and willingness to say and do what is best in given circumstances, and evidence of good breeding and habitual consideration.

22. Adaptability: Ability and willingness to conform properly and readily to the demands of new social situations, cooperativeness.

23. Leadership: Ability to win the confidence of others and to stimulate them to activity.

24. Intellect: Understanding of science subject matter, alertness, and acumen.

25. Scholarship: Relative mastery of the science subject matter as compared with others in your group, also breadth of intellectual interests.

26. Industry: Willingness to spend the necessary time in laboratory proparation, earnestness of purpose, and ability to turn out work.

27. Efficiency: Ability to organize science programs without sacrificing other teaching responsibilities.

28. Sense of responsibility: Ability to recognize obligations and willingness to assume them; relative maturity, dependability, and seriousness of purpose.

29. Promise: This is a general estimate of your success in the field of your specialization or grade level.

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30. Do you like science?

31. Are you able to work effectively with hand tools and hands?

* *

In my college curriculum I have approximately the following number of hours: (A general statement to the best of your recollection is satisfactory)
Key: A. 0-5 B. 6-10 C. 11-15 D. 16-20 E. More than 20

32. General Education science

33. Chemistry

34. Physics

35. Earth Science (astronomy, geology, petrology, etc.)

36. Biology (zoology, botany, bacteriology, ecology, etc.)

* *

37. In my college science courses we had the following kinds of laboratory experiences:
A. Mostly laboratory B. ½ laboratory C. ¼ laboratory D. Occasional laboratory E. No laboratory

38. In my college curriculum courses the following amount of time was devoted to science materials which could be taught at the elementary level:
A. 80% B. 60% C. 40% D. 20% E. Less than 20%

39. In my college science courses I would describe my laboratory experiences as:
A. "Cookbook" B. Highly conventional D. A mixture of conventional and inquiry D. Mostly inquiry (open-ended)

40. I have never requested of my principal or other administrator a change to one of the new innovative types of teaching science.
A. True B. False

41. I have requested of my administrative staff permission to use innovative techniques and the administrative response was:
A. I don't believe in it
B. We don't have the time for this type of teaching
C. It costs too much
D. I will see about it later
E. Refusal

42. I am currently teaching an innovative science course and I began this project with the following administrative support:
A. My administrator insisted that I follow this route
B. My administrator strongly advised that I follow this route
C. My administrator "went along with me"
D. My administrator reluctantly allowed me to participate in this new program

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43. The average expenditure allowed to my class for science equipment during the past three years is approximately:
    A. Less than $50.00
    B. $51.00 to $100.00
    C. $101.00 to $150.00
    D. $151.00 to $200.00
    E. In excess of $200.00

44. The average expenditure allowed to my class for science supplies during the past three years is approximately:
    A. Less than $50.00
    B. $51.00 to $100.00
    C. $101.00 to $150.00
    D. $151.00 to $200.00
    E. In excess of $200.00

Elementary

TEACHER'S INTERVIEW IN-DEPTH

(To be answered on IBM Computer Card)

Yellow Card

Section I

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PERSONAL DATA:

1. Position:

   A. Teacher B. Department Head C. Supervisor D. Coordinator

2. Indicate the type of degree(s) you now have.

   A. Master's degree or beyond B. B.S.E. C. B.S. D. B.A. E. No degree

3. Indicate major area of concentration at the college level:

   A. Chemistry B. Physics C. Biology E. Agriculture

4. Indicate major area of concentration at the college level:

   A. General Science B. Geology C. Elementary D. Secondary E. Other

5. I am certified in:

   A. Chemistry B. Physics C. Biology D. Agriculture

6. I am certified in:

   A. General Science B. Geology C. Elementary D. Secondary E. Other

7. I have attended summer institutes in science the following number of times:

   A. 0 B. 1 C. 2 D. 3 E. More than 3

8. To what extent do you think that your college training prepared you for your present teaching position?

   A. Very well B. Adequately C. Poorly D. Not at all

* *

KEY: Please evaluate the following items for their contribution toward your feelings of adequacy in your present position, and indicate at what level you received training in each area. The following scheme is to be used:

Rating: A. Most helpful B. Helpful C. Somewhat helpful D. Not very helpful E. Least helpful

Level of Training: A. College B. In-service C. Extension D. Institute E. Personal experience

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NOTE: To the person filling in this questionnaire, we will simply list the question and designate after it whether we desire a rating or an indication of the source which applies to the rating.

9. Professional Education courses have contributed to my feeling of adequacy in a way that I describe as: (rating)
10. These professional courses were obtained through the following manner: (level)
11. I would describe my college science content courses as: (rating)
12. I obtained science subject content in the following manner: (level)
13. Objectives and philosophy of science: (rating)
14. Objectives and philosophy of science: (level)
15. History of science: (rating)
16. History of science: (level)
17. Development of lab experiences: (rating)
18. Development of lab experiences: (level)
19. Use of lab equipment: (rating)
20. Use of lab equipment: (level)
21. Use of lab experiences: (rating)
22. Use of lab experiences: (level)
23. Use of instructional materials: (rating)
24. Use of instructional materials: (level)
25. Use of Educational TV, other machines: (rating)
26. Use of Educational TV, other machines: (level)
27. Purchase of materials and equipment: (rating)
28. Purchase of materials and equipment: (level)
29. Planning and organizing for classes: (rating)
30. Planning and organizing for classes: (level)
31. Planning and organizing for labs: (rating)

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32. Planning and organizing for labs: (level)

33. Specific training in modern curricula (BSCS, CHEMS, PSSC, etc.): (rating)

34. Specific training in modern curricula (BSCS, CHEMS, PSSC, etc.): (level)

35. Internship in subject area: (rating)

36. Internship in subject area: (level)

37. Scientific literature: (rating)

38. Scientific literature: (level)

* *

KEY: Use the following key in describing the use made normally of the following instructional materials.

A. Daily B. Weekly C. Occasionally D. Seldom E. Never

39. Textbooks

40. Workbooks

41. Lab manuals

42. Films

43. Slides

44. Educational TV

45. Overhead projectors

46. Opaque projectors

47. Demonstration equipment

48. School library resource material

49. Science consultants

50. Programmed materials

51. Field trips

52. Commercial kits and literature

* *

KEY: How would you rate your school library with respect to the following types of science literature?

A. Excellent B. Good C. Fair D. Poor E. None

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53. Periodicals

54. Books

55. Career information

56. Government and industrial pamphlets

* *

KEY: To what extent are the following items readily available for your use?

A. Easily B. Adequately C. Occasionally D. Rarely E. Not at all

57. Film projectors

58. Slide projectors

59. Overhead projectors

60. Opaque projectors

ELEMENTARY TEACHER'S INTERVIEW IN-DEPTH
SECTION II

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USE RED IBM CARD

* *

Continuation from Page 4, Section I. Use the same key - i.e.
To what extent are the following items readily available for your use?
Key: A. Easily B. Adequately C. Occasionally D. Rarely
E. Not at all

1. TV sets for Educational TV
2. TV sets for closed circuit TV
3. Machines for programmed instruction
4. Duplicating equipment
5. Equipment for making audio-visual aids
6. Audio-Visual center with staff
7. Laboratory equipment
8. Laboratory instruments

* *

In your opinion, how much time are you permitted for the following activities?
Key: A. Maximal B. Adequate C. Limited D. Rarely E. Insufficient

9. Classes
10. Laboratories
11. Laboratory preparation
12. Science project work
13. Revising methods of presentation
14. Research
15. Reading in your field
16. Working with individuals
17. Free time

* *

Questions 18 through 41 -
If you had to design a curriculum for the college preparation of teachers in science, how would you rate each of the items for importance in that curriculum?
Key: A. Absolutely necessary B. Desirable C. Good, if time D. Of little use

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18. Philosophy of Science
19. General science survey
20. Major in subject areas (science)
21. Courses in recent curricula (BSCS, etc.)
22. Preparation and use of audio-visual materials
23. History of science
24. Objectives of science courses
25. Preparation and use of lab materials
26. Design of lab equipment
27. Secondary curriculum and organization
28. Secondary materials and methods for the classroom
29. Secondary internship in teaching
30. History of education
31. Social foundations of education
32. Philosophy of education
33. Educational psychology
34. Human growth and development
35. Study of modern secondary school
36. Economic geography
37. Design of new science facilities
38. Methods for purchase of materials
39. Design of programs for high ability students
40. Preparation of programmed materials
41. Demonstration techniques

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ELEMENTARY

ADMINISTRATIVE QUESTIONNAIRE

If a question does not apply to you, your school, your situation leave line on card blank.

1. Indicate the area(s) in which you now hold certificate.
   A. Elementary B. Junior High C. Secondary D. None

2. Indicate the type of degree(s) you now have.
   A. Master's Degree or beyond B. B.S.E. C. B.S. D. B.A. E. No degree

3. How many additional semester hours of credit have you earned beyond your highest degree as listed in Item 4.
   A. 0-6 B. 7-12 C. 13-21 D. 22-28 E. 29 and above

4. Indicate the item which represents your years of teaching experience.
   A. 0-5 B. 6-10 C. 11-15 D. 16-20 E. More than 20

5. Indicate the number of years since you received your first degree.
   A. 0-5 B. 6-10 C. 11-15 D. 16-20 E. More than 20

6. Indicate the number of years since you received your last degree.
   A. 0-5 B. 6-10 C. 11-15 D. 16-20 E. More than 20

7. Indicate the number of years since you did additional course work - for a salary increment, for certification improvement, for up-dating information.
   A. Presently enrolled (1 year) B. 2 years C. 3 years D. 4 years
   E. 5 or more years

8. What is your approximate age?
   A. 20-25 B. 26-30 C. 31-35 D. 36-40 E. 41-45

9. What is your approximate age?
   A. 46-50 B. 51-55 C. 56-60 D. 61-65 E. 66-70

10. What is your sex:
    A. Male B. Female

11. For which of the new science programs listed below do you currently receive literature?
    A. S-APA B. ESS C. MINNEMAST D. SCIS E. None

12. For which of the following new science programs do you surrently receive literature?
    A. ES D. IDP C. COPE D. ISCS E. Other

13. What is your reaction to these new science programs?
    A. Favorable B. Neutral C. Unfavorable

14. If an innovative program is being used in your school, please indicate which one.
    A. S-APA B. ESS C. MINNEMAST D. SCIS E. None of these

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15. If an innovative program is being used in your school, please indicate which one.
A. ES B. IDP C. COPE D. ISCS E. Other

16. In your school is science being taught as a separate subject or in combination with other subjects?
A. As a separate subject (departmentalized)
B. With other subjects (self-contained classroom)

17. If one of the innovative science programs is being used in your school, please indicate to what extent.
A. One period per week B. Two periods per week C. Three periods per week
D. Four periods per week E. Five periods per week

18. I feel that the community which is served by my school system supports science in the following manner:
A. Supportive and enthusiastically cooperative
B. Supportive and highly cooperative
C. Moderately supportive and cooperative
D. Indifferent toward science
E. Opposes science

* *

In my college curriculum I have approximately the following number of hours:
Key: A. 0-5 B. 6-10 C. 11-15 D. 16-20 E. More than 20

19. General science education

20. Chemistry

21. Physics

22. Earth Science (e.g., astronomy, geology, petrology, etc.)

23. Biology (e.g., zoology, botany, bacteriology, ecology, etc.)

* *

24. In my college science courses I would describe my laboratory experiences as:
A. "Cookbook" B. Highly conventional C. A mixture of conventional and inquiry D. Mostly inquiry (open-ended)

25. I have never requested my teachers to change to one of the new innovative types of teaching science.
A. True B. False

26. I have requested of my principal administrator permission to use innovative techniques and the administrative response was:
A. I don't believe in it
B. We don't have the time for this type of teaching
C. It costs too much
D. I will see about it later
E. Refusal

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27. My school is currently using one or more innovative science courses and I have given these projects the following administrative support:
    A. Insisted that the teacher follow this route
    B. Strongly advised the teacher to follow this route
    C. "Went along" with the teacher
    D. Reluctently allowed the teacher to participate in this new program.

28. The average expenditure allowed per class for science <u>equipment</u> during the past three years is approximately:
    A. Less than $50.00
    B. $51.00 to $100.00
    C. $101.00 to $150.00
    D. $151.00 to $200.00
    E. In excess of $200.00

29. The average expenditure allowed per class for science <u>supplies</u> during the past three years is approximately:
    A. Less than $50.00
    B. $51.00 to $100.00
    C. $101.00 to $150.00
    D. $151.00 to $200.00
    E. In excess of $200.00

* *

Questions 30 through 32 - Key: A. Mostly laboratory B. ½ laboratory C. ¼ laboratory D. Occasional laboratory E. No laboratory

30. In my college general education science courses (e.g., Man and the Scientific World) we had the following kinds of laboratory experiences:

31. In my college content science courses (e.g., biology, earth science, chemistry, physics) we had the following kinds of laboratory experiences:

32. In my college professional education science courses (e.g., Methods, Student Teaching) we had the following kinds of laboratory experiences:

* *

Questions 33 through 35 - Key: A. "Cookbook" B. Highly conventional C. A mixture of conventional and inquiry D. Mostly inquiry (open-ended) E. Other

33. In my college general education science courses (e.g., Man and the Scientific World) I would describe my laboratory experiences as:

34. In my college content science courses (e.g., biology, earth science, chemistry, physics) I would describe my laboratory experiences as:

35. In my college professional education courses (e.g., Methods, Student Teaching) I would describe my laboratory experiences as:

* *

36. Indicate the subjects you now teach or have taught - grades 7 - 9 (Junior High
    A. Earth Science B. Biological Science C. Physical Science D. General Science E. Other

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37. Indicate the subjects you now teach or have taught - grades 9-12 (Senior High)
A. General Science B. Biology C. Chemistry D. Physics E. Other

38. Where did you obtain your information about the innovative science curricula?
A. Workshop(s) - local or college campus
B. Institutes(s) - In-service, summer, or academic year
C. Regular course work (college campus not workshop or institute)
D. Extension class(es)
E. Personal study

39. What is your general reaction to these innovative science curricula?
A. Favorable B. Neutral C. Unfavorable

40. From which of these innovative science curricula are you receiving literature currently?
A. IPS B. BSCS C. CHEM D. HPP E. Other

41. What type of additional education would you prefer for a study of innovative science programs?
A. Workshop - local in evening
B. Workshop - local on Saturday
C. Workshop - 2 or 3 weeks local
D. Workshop - campus Saturdays only
E. Workshop - campus 2 or 3 weeks summer

42. What type of additional education would you prefer for a study of innovative science programs?
A. Institutes - in-service local
B. Institutes - summer college campus
C. Regular course work (college campus not workshop or institute)
D. Extension class(es)
E. Personal study

43. Specify your preference(s) of innovative programs to be covered by additional study - as indicated in items 42 and 42.
A. S-APA (Science, a Process Approach)
B. ESS (Elementary Science Study)
C. MINNEMAST (Minnesota Mathematics and Science Teaching Project)
D. SCIS (Science Curriculum Improvement Study)

44. Specify your preference(s) of innovative programs to be covered by additional study - as indicated in items 41 and 42.
A. ES (Environmental Studies)
B. IDP (Inquiry Development Program in Physical Science)
C. COPE (Conseptually Oriented Program in Elementary Science)
D. ISCS (Intermediate Science Curriculum Study)

45. Type of teaching in which your school is involved.
A. Individual B. Team Teaching C. Modified Team Teaching D. Other

46. Are you teaching science by the "inquiry" (open-ended laboratory) method?
A. Yes. B. No C. Partially

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47. To what extent do you think that his college training prepared your average teacher to teach science?
A. Very well B. Adequately C. Poorly D. Not at all

Please evaluate the following items for their contribution toward the feelings of adequacy of your teachers and indicate at what level they received training in each area. The following scheme is to be used:

Rating: A. Most helpful B. Helpful C. Somewhat helpful D. Not very helpful E. Least helpful

Level of Training: A. College B. In-service C. Extension D. Institute E. Personal experience

NOTE: To the person filling in this questionnaire, we will simply list the question and designate after it whether we desire a rating or an indication of the source which applies to the rating.

48. Professional Education courses have contributed to my feeling of adequacy in a way I describe as: (rating)

49. These professional courses were obtained through the following manner: (level)

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TEACHER QUESTIONNAIRE--SECONDARY

SECTION I

For questions 1 - 60 use YELLOW-banded Porta-Punch Card. In case a question does not apply to you, your school, your situation, skip that question and skip that line on the porta-punch card.

1. What is your sex?
   A. Male B. Female

2. What is your approximate age? - (Skip if not applicable)
   A. 20-25 B. 26-30 C. 31-35 D. 36-40 E. 41-45

3. What is your approximate age? - (Skip if not applicable)
   A. 46-50 B. 51-55 C. 56-60 D. 61-65 E. 66-70

4. Indicate your approximate age at the time you began teaching.
   A. 20-25 B. 26-30 C. 31-35 D. 36-40 E. 41-45

5. Indicate your approximate age at the time you began teaching.
   A. 46-50 B. 51-55 C. 56-60 D. 61-65 E. 66-70

6. Indicate the type of degree(s) you now have.
   A. Master's Degree or beyond B. B.S.E. C. B.S. D. B.A. E. No degree

7. How many additional hours of credit have you earned beyond the highest degree listed in Item 6?
   A. 0-6 B. 7-12 C. 13-21 D. 22-28 E. 29 and above

8. Indicate your age when you received your first degree.
   A. 20's B. 30's C. 40's D. 50's E. 60's

9. Indicate the number of years since you received your last degree.
   A. 0-5 B. 6-10 C. 11-15 D. 16-20 E. More than 20

10. Indicate the number of years since you did additional course work - for a salary increment, for certification improvement, for up-dating information, etc.
    A. Presently enrolled (1 year) B. 2 years C. 3 years D. 4 years
    E. 5 or more years

11. Indicate the item which represents your years of teaching experience.
    A. 0-5 B. 6-10 C. 11-15 D. 16-20 E. More than 20

12. Indicate the type of certificate(s) you now hold.
    A. Life Certificate
    B. 2-year Academic Contract Certificate
    C. Substitute Certificate
    D. 1 - 3-year Examination Certificate
    E. Other

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13. Indicate the area(s) in which you now hold certification.
A. General/Comprehensive Science B. Biology C. Chemistry D. Physics
E. No science area

* *

In my college science courses I have approximately the following number of hours:
Questions 14 through 18 - Key: A. 0-5 B. 6-10 C. 11-15 D. 16-20
E. More than 20.

14. General Education Science

15. Biology

16. Earth Science

17. Chemistry

18. Physics

* *

Questions 19 through 21 - Key: A. Mostly laboratory B. ½ laboratory
C. ¼ laboratory D. Occasional laboratory E. No laboratory

19. In my college general education science courses (e.g., Man and the Scientific World) we had the following kinds of laboratory experiences:

20. In my college content science courses (e.g., biology, earth science, chemistry, physics) we had the following kinds of laboratory experiences:

21. In my college professional education science courses (e.g., Methods, Student Teaching) we had the following kinds of laboratory experiences:

* *

22. In my college curriculum courses the following amount of time was devoted to science materials which could be taught at the secondary level:
A. 80% B. 60% C. 40% D. 20% E. Less than 20%

* *

Questions 23 through 25 - Key: A. "Cookbook" B. Highly conventional
C. A mixture of conventional and inquiry D. Mostly inquiry (open-ended)
E. Other

23. In my college general education science courses (e.g., Man and the Scientific World) I would describe my laboratory experiences as:

24. In my college content science courses (e.g., biology, earth science, chemistry, physics) I would describe my laboratory experiences as:

25. In my college professional education courses (e.g., Methods, Student Teaching) I would describe my laboratory experiences as:

* *

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26. Indicate the subjects you now teach - grades 7 - 9: (Junior High School)
A. Earth Science B. Biological Science C. Physical Science D. General Science E. Other

27. Indicate the subjects you now teach - grades 9 - 12: (Senior High School)
A. General Science B. Biology C. Chemistry D. Physics E. Other

* *

Items 28 through 37. Please use the following key to indicate your knowledge about each of these innovative programs (new science curricula).
Key: A. Thorough B. Good C. Fair D. Little E. No.

28. Biological Science Curriculum Study (BSCS) - Green Version

29. " " " " " - Yellow Version

30. " " " " " - Blue Version

31. " " " " " - Slow-learners Version

32. " " " " " - Biological Inquiry-Advanced Version

33. Harvard Project Physics (HPP)

34. Chemical Education Materials (CHEM)

35. Chemical Bonds Approach (CBA)

36. Introductory Physical Science (IPS)

37. Intermediate Science Curriculum Study (ISCS)

* *

38. Where did you obtain your information about the innovative science curricula?

A. Workshop(s) - (local or college campus)
B. Institute(s) - in-service, summer, or academic year
C. Regular course work (college campus not workshop or institute)
D. Extension class(es)
E. Personal Study

39. What is your general reaction to these innovative science curricula?
A. Favorable B. Neutral C. Unfavorable

40. From which of these innovative science curricula are you receiving literature currently?
A. IPS B. BSCS C. CHEM D. HPP E. Other

41. Would you be willing to participate in an innovative science program (workshop, institute, college campus, extension)?
A. Yes B. No
(If answer is "no" skip questions 42-45)

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42. What type of additional education would you prefer for a study of innovative science programs?
   A. Workshop = local in evening
   B. Workshop = local on Saturday
   C. Workshop = 2 or 3 weeks local
   D. Workshop = campus Saturdays only
   E. Workshop - campus 2 or 3 weeks summer

43. What type of additional education would you prefer for a study of innovative science programs?
   A. Institutes = in-service local
   B. Institutes - summer college campus
   C. Regular course work (college campus not workshop or institute)
   D. Extension class(es)
   E. Personal study

44. Specify your preference(s) of innovative programs to be covered by additional study - as indicated in items 42 and 43.
   A. Biological Science Curriculum Study (BSCS) = Green Version
   B. " " " " " = Yellow Version
   C. " " " " " = Blue Version
   D. " " " " " = Slow learners Version
   E. " " " " " - Biological Inquiry-Advanced Ver

45. Specify your preference(s) of innovative programs to be covered by additional study - as indicated in items 42 and 43.
   A. Harvard Project Physics (HPP)
   B. Chemical Education Materials (CHEM)
   C. Chemical Bonds Approach (CBA)
   D. Introductory Physical Science (IPS)
   E. Intermediate Science Curriculum Study (ISCS)

46. If innovative curriculum is being used in your classroom indicate which one(s). Biological innovative programs:
   A. BSCS = Green version
   B. BSCS = Yellow version
   C. BSCS = Blue version
   D. BSCS = Slow learners version
   E. BSCS - Biological Inquiry - Advanced version

47. If innovative curriculum is being used in your classroom indicate which one(s). Physical Science innovative programs:
   A. HPP
   B. CHEM
   C. CBA
   D. IPS
   E. ISCS

48. Type of teaching in which you are involved.
   A. Individual B. Team Teaching C. Modified Team-Teaching D. Other

49. Are you teaching science by the "inquiry" (open-ended laboratory) method?
   A. Yes B. No C. Partially

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50. What type of textbook are you now using in your science classes?
A. A standard science textbook
B. An innovative science textbook
C. A combination of several books
D. No textbook being used
E. Textbook/materials produced by self and/or teachers of same school system

51. If an innovative science program is being used in your classroom, please indicate which one.
Biological-innovative programs:
A. BSCS = Green version
B. BSCS = Yellow version
C. BSCS = Blue version
D. BSCS = Slow learners version
E. BSCS - Biological Inquiry - advanced version

52. If an innovative science program is being used in your classroom, please indicate which one.
Physical Science innovative programs:
A. HPP
B. CHEM
C. CBA
D. IPS
E. ISCS

53. If one of the innovative science programs is being used in your school, please indicate to what extent.
A. One period per week
B. 2-3 periods per week
C. 4-5 periods per week
D. Variable number of periods per week
E. No time per week

54. What is the approximate length of each of the above periods? (See No. 53)
A. 15 minutes B. 20 minutes C. 25 minutes D. 30 minutes E. More than 30 minutes

55. How much time do you devote to science laboratories on a weekly basis?
A. 1 period B. 2-3 periods C. 4-5 periods D. Variable E. No

* *

Items 56 - 59. Be objective and fair in rating yourself to teach the following secondary school sciences.
Key: A. Superior B. Excellent C. Average D. Fair E. Not qualified to teach this subject

56. General Science (e.g., Geology, including ancient plants and animals; stars and planets; weather; Biology, including present day plants, animals and their ecology; Chemistry, including reactions and atomic energy; and Physics, including machines, magnetism and electricity, sound and light).

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57. Biology (e.g., biospheres; organism similarity and diversity; population dynamics; energy exchange, movement and coordination; continuity; behavior.)

58. Chemistry (e.g, reactions, bonding, phases, atomic structure, periodic table, carbon compounds, halogens, transition elements, biochemistry, energy exchange).

59. Physics (e.g., heat, optics, mechanics, magnetism and electricity, sound, atomic structure, light.)

* *

60. How deeply are you committed to the concept that all educated people must be scientifically literate?
A. Totally B. Partially C. Not D. Indifferent to the Idea E. Oppose the idea

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TEACHER QUESTIONNAIRE - SECONDARY

SECTION II.

For questions 1 - 37 use RED-banded Porta-Punch Card. In case a question does not apply to you, your school, your situation, skip that question and skip that line on the porta-punch card.

Items 1 through 37 deal with the teacher's feeling of adequacy and competence in the classroom. In teaching there is a strong relationship between the perceptual organization of the person and his effectiveness as a teacher.

* *

In the following twenty items (1-20) please rate yourself objectively and fairly according to the following key:
A. Superior B. Excellent C. Average D. Fair E. Poor

In a general frame of reference what do you tend to emphasize in your teaching:

1. An internal rather than an external frame of reference?

2. Concern with people rather than things?

3. Concern with perceptual meanings rather than facts and events?

4. An immediate rather than an historical view of causes of behavior?

As a teacher do you tend to perceive other people and their behavior as:

5. Able rather than unable?

6. Friendly rather than unfriendly?

7. Worthy rather than unworthy?

8. Internally rather than externally motivated?

9. Dependable rather than undependable?

10. Helpful rather than hindering?

As a teacher do you tend to perceive yourself as:

11. With people rather than apart from people?

12. Able rather than unable?

13. Dependable rather than undependable?

14. Worthy rather than unworthy?

15. Wanted rather than unwanted?

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As a teacher do you tend to perceive your teaching task, your teaching assignment, as:

16. Freeing rather than controlling?

17. Larger rather than smaller?

18. Revealing rather than concealing?

19. Involved rather tnan uninvolved?

20. Encouraging process rather than achieving goals?

* *

Items 21 through 31 deal with self-evaluation by use of qualities that are usually associated with the science teaching profession. An individual who is mature and who approaches this with objectivity and fairness can do an excellent job of self-evaluation Use the following key to evaluate yourself:

Key: A. Superior B. Excellent C. Average D. Fair E. Poor

21. Personal appearance: Evidence of propriety and good taste, neatness, cleanliness, and general attractiveness.

22. Poise: Ease and naturalness, carriage, and self possession.

23. Tact and courtesy: Ability and willingness to say and do what is best in given circumstances, and evidence of good breeding and habitual consideration.

24. Adaptability: Ability and willingness to conform properly and readily to the demands of new social situations, cooperativeness.

25. Leadership: Ability to win the confidence of others and to stimulate them to activity.

26. Intellect: Understanding of science subject matter, alertness, and acumen.

27. Scholarship: Relative mastery of the science subject matter as compared with others in your group, also breadth of intellectual interests.

28. Industry: Willingness to spend the necessary time in laboratory preparation, earnestness of purpose, and ability to turn out work.

29. Efficiency: Ability to organize science programs without sacrificing other teaching responsibilities.

30. Sense of responsibility: Ability to recognize obligations and willingness to assume them; relative maturity, dependability, and seriousness of purpose.

31. Promise: This is a general estimate of your success in the field of your specialization or grade level.

* *

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32. I feel that my administrator's attitude toward my science program is:
    A. Supportive and enthusiastically cooperative
    B. Supportive and highly cooperative
    C. Moderately supportive and cooperative
    D. Indifferent toward science
    E. Opposes science

33. I have never asked my principal or other administrator to allow me to try an innovative science program.
    A. True B. False

34. I am currently teaching an innovative science course and I began this project with the following administrative support:
    A. My administrator insisted that I follow this route
    B. My administrator strongly advised that I follow this route
    C. My administrator "went along with me"
    D. My administrator reluctently allowed me to participate in this new program

* *

Items 35 and 36. -The average annual expenditure allowed my science classes during the past three years -

Key:
    A. Less than $50.00
    B. $51.00 to $100.00
    C. $101.00 to $150.00
    D. $151.00 to $200.00
    E. In excess of $200.00

35. For science equipment was approximately:

36. For science supplies, expendable items, was approximately:

* *

37. I feel that the community which is served by my school system supports science in the following manner:

    A. Supportive and enthusiastically cooperative
    B. Supportive and highly cooperative.
    C. Moderately supportive and cooperative.
    D. Indifferent toward science.
    E. Opposes science.

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SECONDARY -

TEACHER'S INTERVIEW IN-DEPTH

SECTION I: Please use Yellow-banded porta-punch card. In case a question does not apply to you, your school, your situation, skip that question and skip that line on the porta-punch card.

1. Position: A. Teacher B. Department Head C. Supervisor D. Coordinator

2. Indicate the type of degree(s) you now have.
   A. Master's degree or beyond B. B.S.E. C. B.S D. B.A. E. No degree

3. Indicate major area of concentration at the college level:
   A. Chemistry B. Physics C. Biology E. Agriculture

4. Indicate major area of concentration at the college level:
   A. General Science B. Geology C. Elementary D. Secondary E. Other

5. I am certified in:
   A. Chemistry B. Physics C. Biology D. Agriculture

6. I am certified in:
   A. General Science B. Geology C. Elementary D. Secondary E. Other

7. I have attended summer institutes in science the following number of times:
   A. 0 B. 1 C. 2 D. 3 E. More than 3

8. I have attended summer workshops in science education:
   A. 0 B. 1 C. 2 D. 3 E. More than 3

9. To what extent do you think that your college education prepared you for your present teaching position?
   A. Excellently B. Very well C/ Adequately D. Poorly E. Not at all

* *

Please evaluate the following items (10 through 41) for: (a) their contribution toward your feelings of adequacy in your present position; and (b) indicate through what type of instruction you received education in each area. The following scheme is to be used:

Rating: A. Most helpful B. Helpful C. Somewhat helpful D. Not very helpful E. Not helpful

Type of Education: A. Regular course work B. Extension C. Institute D. Workshop E. Personal study

10. Professional Education courses: (rating)
11. " " " (type of education)

12. Science content courses: (rating)
13. " " " (type of education)

14. Philosophy of science: (rating)
15. " " " (type of education)

16. History of science: (rating)
17. " " " (type of education)

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18. Development of lab experiences: (rating)
19. " " " " : (type of education)

20. Use of lab equipment: (rating)
21. " " " " : (type of education)

22. Use of lab experiences: (rating)
23. " " " " : (type of education)

24. Use of instructional materials: (rating)
25. " " " " : (type of education)

26. Use of Educational TV: (rating)
27. " " " ": (type of education)

28. Purchase of materials and equipment: (rating)
29. " " " " " : (type of education)

30. Planning and organizing for classes: (rating)
31. " " " " " : (type of education)

32. Planning and organizing for labs: (rating)
33. " " " " " : (type of education)

34. Specific education in modern curricula (e.g., BSCS, CHEM, HPP, etc.): (rating)
35. " " " " " " " " " " (type of educatio

36. Internship in subject area: (rating)
37. " " " " : (type of education)

38. Scientific literature: (rating)
39. " " : (type of education)

40. Use of A-V equipment: (rating)
41. " " " " : (type of education)

* *

Use the following key to indicate your normal usage of the following instructional materials.

Key: A. Daily B. Weekly C. Occasionally D. Seldom E. Never

42. Textbooks
43. Workbooks
44. Lab manuals
45. Programmed materials
46. Educational TV
47. Films - silent and sound
48. Slides (e.g., 35 mm)
49. Transparencies (e.g. 8x10)
50. Overhead Projector
51. Opaque Projector
52. Sound Projector
53. Filmstrip Projector
54. Microprojector
55. Demonstration equipment (teacher)
56. Laboratory equipment (student)
57. Library resource material
58. Government/Industrial material
59. Consultants/Resource Persons
60. Field trips

* *

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TEACHER'S INTERVIEW IN-DEPTH

SECTION II: Please use Red-banded porta punch card.

* *

How would you rate your school library with respect to the following types of science literature?

Key: A. Excellent B. Good C. Fair D. Poor E. None

1. Periodicals
2. Books
3. Reference Books
4. Career information
5. Government pamphlets
6. Industrial pamphlets

* *

To what extent are the following items/personnel available for your use/help?

Key: A. Always L. Usually C. Occasionally D. Rarely E. Not

7. Tape recorders
8. Film projectors
9. Slide projectors
10. Overhead projectors
11. Opaque projectors
12. Microprojector
13. TV sets for educational/closed circuit TV
14. Machines for programmed instruction
15. Duplicating equipment
16. Photocopying equipment
17. Equipment for making audio-visual aids (e.g., 8x10 transparencies)
18. Audio-visual center
19. Audio-visual library
20. Laboratory equipment
21. Laboratory supplies

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22. Student lab assistant(s)

23. Student A-V assistant(s)

24. Professional A-V Staff

* *

In your opinion, how much time are you permitted for the following activities?
Key: A. Adequate B. Limited C. Insufficient D. No

25. Classes

26. Class preparations

27. Laboratories

28. Laboratory preparation

29. Science project work

30. Working with individual students

31. Research

32. Reading in your field

33. Professional/open period

* *

If you were to design a curriculum for the preparation of secondary school science teachers, how would you rate each of the following items for inclusion in that curriculum?
Key: A. Absolutely necessary B. Desirable C. Acceptable D. Of no value

34. Philosophy of science

35. History of science

36. General science survey

37. Major in subject areas (science)

38. Courses in recent curricula (BSCS, etc.)

39. Preparation and use of audio-visual materials

40. Preparation and use of lab materials

41. Design of lab experiences

42. Curriculum and organization

43. Materials and methods for the classroom/lab

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44. Internship (student teaching) in teaching
45. History of education
46. Philosophy of education
47. Educational psychology
48. Social foundations of education
49. Human growth and development
50. Study of modern secondary school
51. Economic geography
52. Design of new science facilities
53. Methods for purchase of materials
54. Design of programs for atypical students
55. Preparation of programmed materials
56. Demonstration techniques

* *

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SECONDARY

ADMINISTRATIVE QUESTIONNAIRE

If a question does not apply to you, your school, your situation leave line on card blai

1. Indicate the area(s) in which you now hold certificate.
   A. Elementary B. Junior High C. Secondary D. None E. Administrator

2. Indicate the type of degree(s) you now have.
   A. Master's Degree or beyond B. B.S.E. C. B.S. D. B.A. E. No degree

3. How many additional semester hours of credit have you earned beyond your highest degree as indicated in item 2.
   A. 0-6 B. 7-12 C. 13-21 D. 22-28 E. 29 and above

4. Indicate the item which represents your years of teaching experience.
   A. 0-5 B. 6-10 C. 11-15 D. 16-20 E. More than 20

5. Indicate the number of years since you received your first degree.
   A. 0-5 B. 6-10 C. 11-15 D. 16-20 E. More than 20

6. Indicate the number of years since you received your last degree.
   A. 0-5 B. 6-10 C. 11-15 D. 16-20 E. More than 20

7. Indicate the number of years since you did additional course work - for a salary increment, for certification improvement, for up-dating information.
   A. Presently enrolled (1 year) B. 2 years C. 3 years D. 4 years
   E. 5 or more years

8. What is your approximate age?
   A. 20-25 B. 26-30 C. 31-35 D. 36-40 E. 41-45

9. What is your approximate age?
   A. 46-50 B. 51-55 C. 56-60 D. 61-65 E. 66-70

10. What is your sex?
    A. Male B. Female

11. For which of the new science programs listed below do you currently receive literature?
    Biological innovative programs:
    A. BSCS - Green version
    B. BSCS - Yellow version
    C. BSCS - Blue version
    D. BSCS - Slow learners version
    E. BSCS - Biological Inquiry - advanced version

12. For which of the following new science programs (listed below) do you currently receive literature?
    Physical Science innovative programs:
    A. HPP
    B. CHEM
    C. CBA
    E. IPS
    E. ISCS

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13. What is your reaction to these new science programs?
A. Favorable B. Neutral C. Unfavorable

14. If an innovatibe science program is being used in your schools, please indicate which one of the biological innovative programs.
A. BSCS - Green version
B. BSCS - Yellow version
C. BSCS - Blue version
D. BSCS - Slow learners version
E. BSCS - Biological Inquiry - advanced version

15. If an innovative science program is being used in your school, please indicate which one of the physcial science innovative programs.
A. HPP
B. CHEM
C. CBA
D. IPS
E. ISCS

16. In your school is science being taught as a separate subject or in combination with other subjects:
A. As a separate subject (departmentalized)
B. With other subjects (self-contained classroom)

17. If one of the innovative science programs is being used in your school, please indicate to what extent.
A. One period per week
B. Two periods per week
C. Three periods per week
D. Four periods per week
E. Five periods per week

18. If one of the innovative science programs is being used in your school, please indicate to what extent.
A. 1 period per week B. 2-3 periods per week C. 4-5 periods per week
D. Variable number of periods per week E. No time per week

19. What is the approximate length of each of the above periods? (See No. 18)
A. 15 minutes B. 20 minutes C. 25 minutes E. 30 minutes E. More than 30 minutes

20. How much time do you devote to science laboratories on a weekly basis?
A. 1 period B. 2-3 periods C. 4-5 periods D. Variable E. No

21. I feel that the community which is served by my school system supports science in the following manner:
A. Supportive and enthusiastically cooperative.
B. Supportive and highly cooperative.
C. Moderately supportive and cooperative.
D. Indifferent toward science.
E. Opposes science.

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* *

In my college curriculum I have approximately the following number of hours:
Key: A. 0-5 B. 6-10 C. 11-15 D. 16-20 E. More than 20

22. General science education

23. Chemistry

24. Physics

25. Earth Science (astronomy, geology, petrology, etc.)

26. Biology (zoology, botany, bacteriology, ecology, etc.)

* *

27. In my college science courses I would describe my laboratory experiences as:
A. "Cookbook" B. Highly conventional D. A mixture of conventional and inquiry D. Mostly inquiry (open-ended)

28. I have never requested my teachers to change to one of the new innovative types of teaching science.
A. True B. False

29. I have requested of my principal administrator permission to use innovative techniques and the administrative response was:
A. I don't believe in it
B. We don't have time for this type of teaching
C. It costs too much
D. I will see about it later
E. Refusal

30. My school is currently using one or more innovative science courses and I gave this/these projects the following administrative support:
A. Insisted that the teacher follow this route
B. Strongly advised that my teacher follow this route
C. "Went along with it"
D. Reluctently allowed the teacher to participate in this new program

31. The average expenditure allowed per class for Science Equipment during the past three years is approximately:
A. Less than $50.00
B. $51.00 to $100.00
C. $101.00 to $150.00
D. $151.00 to $200.00
E. In excess of $200.00

32. The average expenditure allowed per class for Science Supplies during the past three years is approximately:
A. Less than $50.00
B. $51.00 to $100.00
C. $101.00 to $150.00
D. $151.00 to $200.00
E. In excess of $200.00

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Questions 33 through 35 - Key: A. Mostly laboratory B. ½ laboratory C. ¼ laboratory D. Occasional laboratory E. No laboratory

33. In my college general education science courses (e.g., Man and the Scientific World) we had the following kinds of laboratory experiences:

34. In my college content science courses (e.g., biology, earth science, chemistry, physics) we had the following kinds of laboratory experiences:

35. In my college professional education science courses (e.g., Methods, Student Teaching) we had the following kinds of laboratory experiences:

* *

Questions 36 through 38 - Key: A. "Cookbook" B. Highly conventional C. A mixture of conventional and inquiry D. Mostly inquiry (open-ended)

36. In my college general education science courses (e.g., Man and the Scientific World) I would describe my laboratory experiences as:

37. In my college content science courses (e.g., biology, earth science, chemistry, physics) I would describe my laboratory experiences as:

38. In my college professional education courses (e.g., Methods, Student Teaching) I would describe my laboratory experiences as:

* *

39. Indicate the subjects you now teach or have taught in grades 7 - 9: (Junior High School)
A. Earth Science B. Biological Science C. Physical Science D. General Science E. Other

40. Indicate the subjects you now teach or have taught in grades 9 - 12: (Senior High School)
A. General Science B. Biology C. Chemistry D. Physics E. Other

41. Where did you obtain your information about the innovative science curricula?
A. Workshop(s) - local or college campus)
B. Institute(s) - in-service, summer, or academic year
C. Regular course work (college campus <u>not</u> workshop or institute)
D. Extension class(es)
E. Personal study

42. What is your general reaction to these innovative science curricula?
A. Favorable B. Neutral C. Unfavorable

43. From which of these innovative science curricula are you receiving literature currently:
A. IPS B. BSCS C. DHEM D. HPP E. Other

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44. What type of additional education would you prefer for a study of innovative science programs:
    A. Workshop - local in evening
    B. Workshop - local on Saturday
    C. Workshop - 2 or 3 week local
    D. Workshop - campus Saturdays only
    E. Workshop - campus 2 or 3 weeks summer

45. What type of additional education would you prefer for a study of innovative science programs?
    A. Institutes - in-service local
    B. Institutes - summer college campus
    C. Regular course work (college campus not workshop or institute)
    D. Extension classes
    E. Personal study

46. Specify your preference(s) of innovative programs to be covered by additional study as indicated in items 44 and 45:
    A. Biological Science Curriculum Study (BSCS) - Green Version
    B. " " " " " - Yellow Version
    C. " " " " " - Blue Version
    D. " " " " " - Slow Learners Version
    E. " " " " " - Biological Inquiry Advanced Version

47. Specify your preference(s) of innovative programs to be covered by additional study as indicated in items 44 and 45:
    A. Harvard Project Physics (HPP)
    B. Chemical Education Materials (CHEM)
    C. Chemical Bonds Approach (CBA)
    D. Introductory Physical Science (IPS)
    E. Intermediate Science Curriculum Study (ICIS)

48. Type of teaching in which your school is involved.
    A. Individual B. Team Teaching C. Modified Team Teaching D. Other

49. Are you teaching science by the "Inquiry" (open-ended laboratory) method?
    A. Yes B. No C. Partially

50. To what extent do you think that his college training prepared your average teacher to teach science?
    A. Very well B. Adequately C. Poorly D. Not at all

* *

Please evaluate the following items for their contribution toward the feelings of adequacy of your teachers and indicate at what level they received training in each area. The following scheme is to be used:

Rating: A. Most helpful B. Helpful C. Somewhat helpful D. Not very helpful

Type of Education: A. Regular classes B. In-service C. Extension D. Workshop or institute E. Personal experience

Note: To the person filling in this questionnaire, we will simply list the question and designate after it whether we desire a rating or an indication of the

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source which applies to the rating.

51. Professional education courses have contributed to my feeling of adequacy in a way I describe as: (rating)

52. These professional education courses were obtained through the following manner (type of education)